Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE
NASIONALE SENIOR SERTIFIKAAT

GRADE/GRAAD 11

NOVEMBER 2013

MATHEMATICS P1/WISKUNDE V1
MEMORANDUM

MARKS/PUNTE: 150

This memorandum consists of 9 pages.
Hierdie memorandum bestaan uit 9 bladsye.

QUESTION/VRAAG 1

1.1		$x = \frac{5}{3x-2}$ $\therefore 3x^2 - 2x - 5 = 0$ $\therefore (3x-5)(x+1) = 0$ $\therefore x = \frac{5}{3}$ or/of $x = -1$	(3)	✓ standard form standaard vorm ✓ factorisation faktorisering ✓ values of x waardes van x
1.2	1.2.1	$ax^2 + bx + c = 0$ $\therefore x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	(1)	✓ formula formule
	1.2.2	$x(3x + 13) = 11$ $\therefore 3x^2 + 13x - 11 = 0$ $x = \frac{-13 \pm \sqrt{(13)^2 - 4(3)(-11)}}{2(3)}$ $= \frac{-13 \pm \sqrt{169 + 132}}{6}$ $= \frac{-13 \pm \sqrt{301}}{6}$ $\therefore x = 0{,}72$ or/of $x = -5{,}06$	(4)	✓ standard form standaard vorm ✓ sub into formula vervanging in formule ✓✓ values of x waardes van x
1.3	1.3.1	$(81x^{-4})^{\frac{3}{4}} = \left(\frac{3^4}{x^4}\right)^{\frac{3}{4}} = \frac{27}{x^3}$ or/of $27x^{-3}$	(2)	✓ simplification vereenvoudiging ✓ answer antwoord
	1.3.2	$4(3 - \sqrt{5})(3 + \sqrt{5})$ $= 4(9 - 5)$ $= 16$	(2)	✓ simplification vereenvoudiging ✓ answer antwoord
			[12]	

QUESTION/VRAAG 2

2.1	2.1.1	$\frac{4x^2 + 2x + 1}{4x^2 - 2x + 1} = k$ $\therefore 4x^2 + 2x + 1 = 4kx^2 - 2kx + k$ $\therefore 4x^2 - 4kx^2 + 2x + 2kx + 1 - k = 0$ $\therefore (4 - 4k)x^2 + (2 + 2k)x + (1 - k) = 0$	(3)	✓ cross-multiplication kruisver-menigvuldig ✓ simplification vereenvoudiging ✓ answer antwoord
	2.1.2	If roots are real, then/ As wortels reëel is, dan is: $\Delta \geq 0$ $\therefore (2 + 2k)^2 - 4(4 - 4k)(1 - k) \geq 0$ $\therefore 4 + 8k + 4k^2 - 4(4 - 8k + 4k^2) \geq 0$ $\therefore 4 + 8k + 4k^2 - 16 + 32k - 16k^2 \geq 0$ $\therefore -12k^2 + 40k - 12 \geq 0$ $\therefore 3k^2 - 10k + 3 \leq 0$ $\therefore (3k - 1)(k - 3) \leq 0$ $\therefore \frac{1}{3} \leq k \leq 3$	(5)	✓ statement: $\Delta \geq 0$ ✓ substitute in Δ vervang in Δ ✓ simplification vereenvoudiging ✓ standard form standaard vorm ✓ factorisation faktorisering
2.2		$\sqrt{108} - \sqrt{18} = \sqrt{36 \text{ x } 3} - \sqrt{9 \text{ x } 2}$ $= 6\sqrt{3} - 3\sqrt{2}$ $= 6b - 3a$	(2)	✓ simplification vereenvoudiging ✓ answer antwoord

2.3	$\frac{3^{x+3}.12^{x-3}}{2^{2x-6}.9^{x}} = \frac{3^{x+3}.3^{x-3}.2^{2x-6}}{2^{2x-6}.3^{2x}}$ $= \frac{3^{x+3+x-3}.2^{2x-6}}{2^{2x-6}.3^{2x}}$ $= 3^0.2^0$ $= 1$	(3)	✓ express in exponential form druk uit in eksponent-vorm ✓ simplification vereenvoudiging ✓ answer/ antwoord
2.4	$(x+1)(2x-3) > 3$ $2x^2 - x - 3 - 3 > 0$ $2x^2 - x - 6 > 0$ $(2x+3)(x-2) > 0$ $\therefore x < -\frac{3}{2}$ or/of $x > 2$  	(4)	✓ simplification vereenvoudiging ✓ factorisation faktorisering ✓$x < -\frac{3}{2}$ ✓$x > 2$
2.5	$2x - y = 3$ $\therefore -y = -2x + 3$ $\therefore y = 2x - 3$ Substitute into/Stel in $27^{\frac{x}{3}} = 3^{y-1}$ $\therefore (3^3)^{\frac{x}{3}} = 3^{(2x-3)-1}$ $\therefore 3^x = 3^{2x-4}$ $\therefore x = 2x - 4$ $-x = -4$ $\therefore x = 4$ and/en $y = 2(4) - 3 = 5$ $\therefore x = 4$ and/en $y = 5$	(6)	✓ y the subject y die onderwerp ✓ substituting vervanging ✓ simplification of exponents ✓ vereenvoudiging van eksponente ✓ value of x waarde van x ✓ value of y waarde van y
		[23]	

QUESTION/VRAAG 3

3.1	3.1.1	x = 3	(2)	✓✓answer antwoord
	3.1.2	When/Wanneer $x \geq 0, x \neq 3$	(2)	✓✓answer antwoord
3.2	3.2.1	$\sqrt{5-2x} = \frac{x}{2} + 4$ $5 - 2x \geq 0$ $\therefore -2x \geq -5$ $\therefore x \leq \frac{5}{2}$ and/en $\frac{x}{2} + 4 \geq 0$ $\therefore \frac{x}{2} \geq -4$ $\therefore x \geq -8$ $\therefore -8 \leq x \leq \frac{5}{2}$	(5)	✓$5 - 2x \geq 0$ ✓$x \leq \frac{5}{2}$ ✓$\frac{x}{2} + 4 \geq 0$ ✓$x \geq -8$ ✓$-8 \leq x \leq \frac{5}{2}$
	3.2.2	$\sqrt{5-2x} = \frac{x}{2} + 4$ $5 - 2x = \left(\frac{x}{2} + 4\right)^2$ $5 - 2x = \frac{x^2}{4} + 4x + 16$ $\therefore 20 - 8x = x^2 + 16x + 64$ $\therefore x^2 + 24x + 44 = 0$ $\therefore (x+22)(x+2) = 0$ $\therefore x \neq -22$ not valid/n.v.t. or/of $x = -2$ Since/Aangesien $-8 \leq x \leq \frac{5}{2}$ Solution/Oplossing $x = -2$	(5)	✓ square both sides kwadreer beide kante ✓ simplification vereenvoudiging ✓ standard form standaard vorm ✓ exclusion of -22 uitlating van -22 ✓ solution oplossing
			[14]	

QUESTION/VRAAG 4

4.1	$A = P(1 - in)$ $\therefore A = R15\,000\left(1 - \frac{12}{100}\text{x } 6\right)$ $= R4\,200$		(3)	✓ formula formule ✓ substituting vervanging ✓ answer antwoord
4.2	4.2.1	$\frac{15\%}{12} = 1{,}25\%$ per month/per maand/0,0125	(1)	✓ answer/antwoord
	4.2.2	$i_{eff} = \left(1 + \frac{i^m}{m}\right)^m$ -1 $(1 + 0{,}0125)^{12}$ -1 = 0,1607545 ... $= 16{,}1\%\ p.a./p.j.$	(4)	✓ correct formula korrekte formule ✓ substituting vervanging ✓ simplification vereenvoudiging ✓ answer/antwoord
	4.2.3	$A = P(1 + i)^n = R2\,500(1 + 0{,}0125)^{7x12}$ $= R2\,500(1 + 0{,}0125)^{84}$ $= R7\,097{,}78$	(3)	✓ substituting into correct formula vervanging in korrekte formule ✓ values of *i* and *n* waardes van *i* en *n* ✓ answer/antwoord
4.3	$A = P_1(1 + i)^n + P_2(1 + i)^n$ $= R550\,000\left(1 + \frac{0{,}18}{4}\right)^{7\times4} + R560\,000\left(1 + \frac{0{,}18}{4}\right)^{3\times4}$ $= R2\,836\,028{,}60$ Or/Of T_0_____T_4_____T_7 A = $R550\,000\left(1 + \frac{0{,}18}{4}\right)^{4\times4}$ $R1\,672\,303{,}584\left(1 + \frac{0{,}18}{4}\right)^{3\times4}$ = R1 112 303,584 + R560 000 = R1 672 303,584 = R2 836 028,60		(5)	✓ formula formule ✓ sub/verv $P_1(1 + i)^n$ ✓ sub/verv $P_2(1 + i)^n$ ✓✓ answer/antwoord

[16]

QUESTION/VRAAG 5

5.1	R4 000	(1)	✓ answer/antwoord
5.2	A = P(1 – *i*n) $\text{R4 000} = 15\,000(1 - 8{,}5i)$ $i = 0{,}08627$ ∴ the rate of straight-line depreciation is/die reguitlynwaardeverminderingskoers is 8,6%	(2)	✓ value of *i* waarde van *i* ✓ depreciation interest rate/waardevermindering rentekoers
5.3	A = P(1-*i*)^n $4\,000 = 15\,000(1 - i)^{8{,}5}$ $i = 0{,}144$ ∴ the rate of reducing-balance depreciation is/die balansvermideringkoers 14,4%	(2)	✓ value of *i* waarde van *i* ✓ depreciation interest rate/waardevermindering

[5]

QUESTION/VRAAG 6

6.1	Figure number	1	2	3	4	**6**	11		✓ ✓ ✓ ✓ ✓ 1 mark for each column completed
	Number of shaded tiles	4	**16**	36	**64**	144	**484**		
	No of white tiles	1	9	**25**	49	**121**	**441**		
	Total number of tiles	5	**25**	61	113	**265**	***925***	(5)	

6.2

5 25 61 113

20 36 52

16 16

2a = 16 3a + b = 20 a + b + c = 5

a = 8 b = 20 – 24 c = 5 – 4

b = -4 c = 1

$T_n = 8n^2 - 4n + 1$

Or/Of

$T_n = (2n)^2 + (2n-1)^2$

$= 4n^2 + 4n^2 - 4n + 1$

$= 8n^2 - 4n + 1$

(3)

✓ set up of equation opstel van verg.
✓ simplification vereenvoudiging
✓ formula formule
✓ second constant difference tweede konstante verskil
✓ values of a, b and c waardes van a, b en c
✓ formula formule

[8]

QUESTION/VRAAG 7

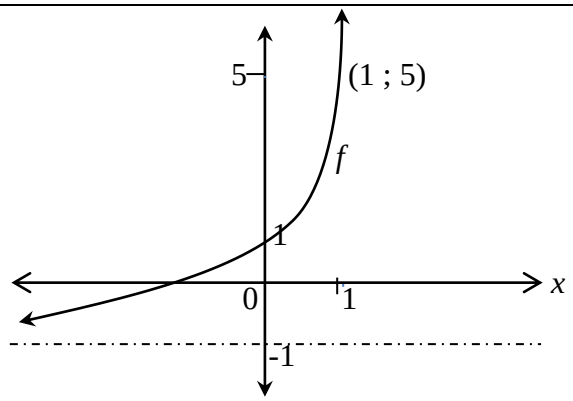
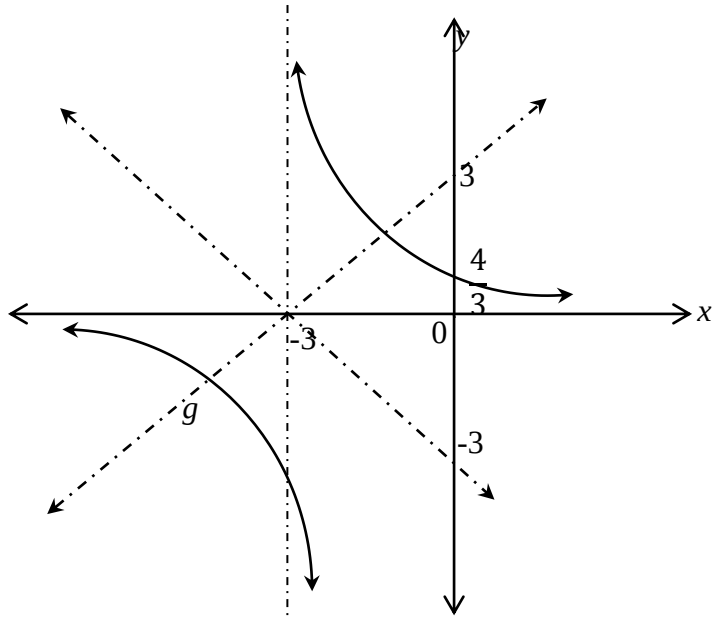
7.1	29	(1)	✓ answer/antwoord
7.2	$T_n = an^2 + bn + c$ $1 = a + b + c$ $\therefore c = 1 - a - b$ $5 = 4a + 2b + c$ $5 = 4a + 2b + 1 - a - b$ $4 = 3a + b$ (1) $11 = 9a + 3b + c$ $11 = 9a + 3b + 1 - a - b$ $\therefore 10 = 8a + 2b$ (2) Solving (1) and (2) simultaneously. Los (1) en (2) gelyktydig op. $8 = 6a + 2b$ (1) x 2 $10 = 8a + 2b$ (2) $\therefore 2 = 2a$ $\therefore a = 1$ $\therefore b = 1$ $\therefore c = -1$ $T_n = n^2 + n - 1$ Or/Of	(7)	✓$c = 1 - a - b$ ✓$4 = 3a + b$ ✓$10 = 8a + 2b$ ✓$a = 1$ ✓$b = 1$ ✓$c = -1$ ✓$T_n = n^2 + n - 1$

	$T_n = an^2 + bn + c$ $1 = a + b + c$ (1) $5 = 4a + 2b + c$ (2) $11 = 9a + 3b + c$ (3) (2) - (1) $3a + b = 4$ (4) (3) - (2) $5a + b = 6$ (5) (5) - (4) $2a = 2$ $\therefore a = 1$ $\therefore b = 1$ $\therefore c = -1$ $T_n = n^2 + n - 1$ Or/Of 1 5 11 19 29 4 6 8 10 2 2 2 2a = 2 3a + b = 4 a + b + c = 1 a = 1 3 + b = 4 1 + 1 + c = 1 b = 1 c = -1 $T_n = n^2 + n - 1$	(7)	✓ Substitution into T_1 vervanging in T_1 Substitution into T_2 vervanging in T_2 Substitution into T_3 vervanging in T_3 ✓ value of a ✓✓ value of b waarde van b ✓✓ value of c waarde van c ✓ T_n ✓ Constant second difference/Konstante tweede verskil ✓ value of a waarde van a ✓✓ value of b waarde van b ✓✓ value of c waarde van c ✓ T_n
7.3	$T_n = n^2 + n - 1$ or/of $T_n = 100(101) - 1$ $\therefore T_{100} = 100^2 + 100 - 1 = 10\,099$ $= 10\,099$	(3)	✓✓ substitution into T_n vervanging in T_n ✓ answer antwoord

[11]

QUESTION/VRAAG 8

8.1	y = -1	(1)	✓ y = -1
8.2	y-intercept: $x = 0$ $y = 2.3^0 - 1$ $= 2.1 - 1$ $= 1$ $\therefore (0 ; 1)$	(2)	✓ value of y waarde van y ✓ coordinate koördinaat
8.3	$x = 1$: y = $2.3^1 - 1 = 5$ $\therefore (1 ; 5)$	(2)	✓ x-coordinate x-koördinaat ✓ y-coordinate y-koördinaat

8.4		(3)	✓ shape vorm ✓ *y*-intercept *y*-afsnit ✓ *y*-asymptote *y*-asimptote
8.5	$y > -1$	(1)	✓ $y > -1$
8.6	x = 3 y = 0	(2)	✓ *x*-asymtote/ *x*-asimptote ✓ *y*-asymtote/ *y*-asimptote
8.7	$g(0) = \frac{4}{0+3} = \frac{4}{3}$ $\therefore \left(0 ; \frac{4}{3}\right)$	(2)	✓ *g*(0) ✓ coordinate koördinaat
8.8	$y = x + 3$ $y = -x - 3$	(2)	✓ $y = x + 3$ ✓ $y = -x - 3$
8.9		(4)	✓ asymptote asymptote ✓ *y*-intercept y-afsnit ✓✓ one mark for each branch een punt vir elke tak
8.10	$AG = \frac{g(x_2) - g(x_1)}{x_2 - x_1}$ $= \frac{1-4}{1+2}$ = -1	(3)	✓ formula formule ✓ substitution vervanging ✓ answer antwoord

[22]

QUESTION/VRAAG 9

9.1	9.1.1	$y = a(x - x_1(x - x_2)$ $y = a(x+2)(x-3) = a(x^2 - x - 6)$ At (0 ; -12): -12 = *a*(-6) $\therefore a = 2$ $a = 2$ $\therefore y = 2x^2 - 2x - 12$	(4)	✓ factors faktore ✓ simplification vereenvoudiging ✓ value of *a* waarde van *a* ✓ equation vergelyking
	9.1.2	$y = 2(2x^2 - 2x - 12)$ $= 2(x^2 - x - 6)$ $= 2(x^2 - x + \frac{1}{4} - 6 - \frac{1}{4})$ $= 2\left[\left(x - \frac{1}{2}\right)^2 - 6\frac{1}{4}\right]$ $= 2\left(x - \frac{1}{2}\right)^2 - 6\frac{1}{4}$	(3)	✓ factorisation faktorisering ✓ completion of the square voltooiing van die kwadraat ✓ simplification vereenvoudiging
9.2	9.2.1	$f(x) = -(x^2 - x - 12)$ $= -(x-4)(x+3)$ C(0 ; 12) and/en D(4 ; 0)	(3)	✓ factorisation faktorisering ✓ C-coordinate C-koördinaat ✓ D-coordinate D-koördinaat
	9.2.2	m = -3 and/en c = 12 $\therefore g(x) = -3x + 12$	(2)	✓ *m* and/en C ✓ *g(x)=-3x+12*
	9.2.3	OB = $\frac{1}{2}$ or/of $\therefore g\left(\frac{1}{2}\right) = -3\left(\frac{1}{2}\right) + 12 = 10\frac{1}{2}$ $f(x) = -x^2 + x + 12$ $= -(\frac{1}{2})^2 + \frac{1}{2} + 12$ $= -\frac{1}{4} + \frac{2}{4} + 12$ AE = AB – EB $= \frac{1}{4} + 12$ $\therefore$AE = $12\frac{1}{4} - 10\frac{1}{2}$ $f(x) = 12\frac{1}{4}$ $= 1\frac{3}{4}$	(3)	✓ $g\left(\frac{1}{2}\right)$ ✓ $10\frac{1}{2}$ ✓ length of AE lengte van AE
	9.2.4	$x > \frac{1}{2}$	(1)	✓ $x > \frac{1}{2}$
	9.2.5	$y \leq 12\frac{1}{4}$	(1)	✓ $y \leq 12\frac{1}{4}$

[17]

QUESTION/VRAAG 10

10.1	$f(x)$ = (x – 3)(x + 1) = x^2 -2x – 3	(3)	✓ x^2 ✓ -2*x* ✓ -3

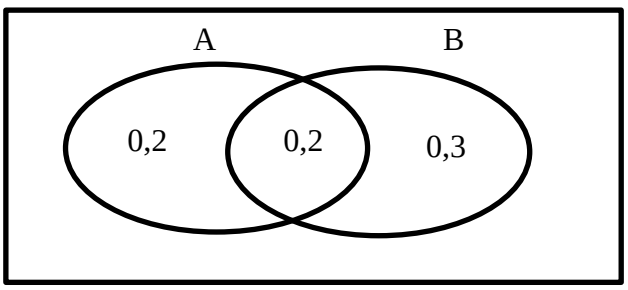
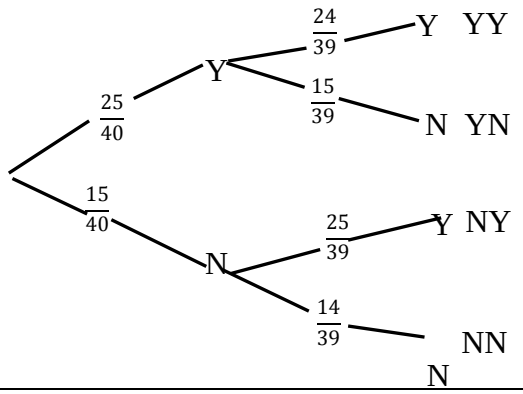
[3]

QUESTION/VRAAG 11

11.1	P(M) x P(N) = $\frac{1731}{2201} x \frac{1490}{2201} = 0{,}532$ P(M and N) = $\frac{1364}{2201}$ = 0,62 ∴ P(M) x P(N) ≠ P(M and/en N) ∴ M and N are not independent events ∴ M en N is nie onafhanklike gebeurtenisse		(4)	✓ P(M) correct/korrek ✓ P(N) correct/korrek ✓ P(M and N) correct P(M en N) korrek ✓ correct rule used korrekte reël gebruik

[4]

QUESTION/VRAAG 12

12.1	12.1.1	A and/en B are independent/is onafhanklik (given/gegee) ∴ P(A and/en B) = P(A) x P(B) = 0,4 x 0,5 = 0,2  ∴ P(A or/of B) = 0,2 + 0,2 + 0,3 = 0,7	(4)	Venn diagram ✓ P(A and/en B) = 0,2 ✓ P(A and not B) = 0,2 P(A en nie B) = 2 ✓ P(B and not A) = 0,3 P(B en nie A) = 0,3 ✓ P(A or/of B) = 0,3
	12.1.2	P(neither/nie A nor/of B) = 1 – (0,2 + 0,2 + 0,3) = 0,3	(1)	✓ answer correct antwoord korrek
12.2	12.2.1	Do you own a a cellphone Besit jy 'n selfoon? 	(7)	✓ tree diagram shows different outcomes ✓✓✓✓✓✓ each probability correct elke moontlikheid korrek
	12.2.2	P(one will own a cellphone and the other not) P(een sal 'n selfoon besit en die ander nie) = $\frac{25}{40}$x$\frac{15}{39} + \frac{15}{40}x\frac{25}{39} = 0{,}48$	(3)	✓ first product/eerste produk ✓ second product/tweede produk ✓ answer correct antwoord korrek

[15]

TOTAL/TOTAAL: 150